Docket No.: 04607/0202709-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Gregory C. Simmons

Application No.: 10/528,185 | Confirmation No.: N/A

Filed: March 17, 2005 | Art Unit: N/A

For: APPARATUS FOR IMPROVING VEHICLE PERFORMANCE | Examiner: Not Yet Assigned

AFFIRMATION OF CLAIM FOR PRIORITY

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant hereby claims priority under 35 U.S.C. 119 based on the following prior foreign application filed in the following foreign country on the date indicated:

Country	Application No.	Date
United Kingdom	0221575.4	September 17, 2002

In support of this claim, attached is Form PCT/IB/304 evidencing receipt of the priority

document on November 17, 2003 during prosecution of International Application No. PCT/GB03/04121.

Dated: July 20, 2005

Respectfully submitted,

By _____ (53,970)

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10/528185

1 MAR 2005

INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
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Dated 22 October 2003

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The Patent Office

18SEP02 E748925-7 D02136
P01/7700 0.00-0221575.4

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THE PATENT OFFICE
17 SEP 2002
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(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference — RJ/RD/N13008

2. Patent application number *(The Patent Office will fill this part)* — 0221575.4 — 17 SEP 2002

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

H Technologies Limited
Unit E
Riverside Industrial Estate
West Sussex
BN17 5DF

Patents ADP number *(if you know it)* 8189656001

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention — Process for the Transfer of Data

5. Name of your agent *(if you have one)* — Williams Powell

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

4 St. Paul's Churchyard
London
EC4M 8AY

Patents ADP number *(if you know it)* 5 830310001 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earleir UK application, give the number and the filing date of the earlier application.

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(answer 'Yes if:*

a) any applicant named in part 3 is not an inventor, or
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c) any named applicant is a corporate body

Yes

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	6
Claim(*s*)	DMC
Abstract	
Drawing(*s*)	3+3

10. If you are filing one of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/we request the grant of a patent on the basis of this application.

Signature

Date
17 September 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr Lee Anderson 020 7329 4400

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Notes

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APPARATUS FOR IMPROVING VEHICLE PERFORMANCE

The present invention relates to a system for improving the performance of a vehicle, particularly a motorcycle or other wheeled vehicle. In the preferred embodiment it relates to a system for reducing the gyroscopic forces produced during operation of a motorcycle.

The dynamic performance of current racing motorcycles is such that the industry is constantly looking for improvements in design that will assist in improving the overall speed of the vehicle. One such area of development is the wheels on which the machine rides. These wheel contribute to the overall performance of the vehicle in several ways: 1) they are the point at which the tyre is connected to the bike, 2) the brake disc is attached to the wheel, providing the mechanism for slowing the vehicle and 3) the rotational or gyroscopic characteristics which maintain vehicle stability.

Referring to Figure 1, a specifically designed gyroscope would usually take the form of a disc-shaped object but can be virtually any object such that when rotated it produces an effective gyroscopic behaviour. Most of a gyroscope's mass should be as far away from the centre as possible. This often results in a disc-shaped object with a large heavy rim, as shown in Figure 1.

When the gyroscope is not rotating, it behaves like any other object. However, when the gyroscope is spun on its axis at high speed it resists movements in certain directions. When the gyroscope is spinning it can contain large amounts of stored energy. Under Newton's first law of motion it is stated that any body will continue in its state of motion (still or travelling) unless acted upon by an unbalanced force. In the instance of a gyroscope, it will try to compensate for this movement which is known as gyroscopic precession.

The best way to understand gyroscopic precession is to look at two small sections of the gyroscope as it is rotating, the top and the bottom, as shown in Figure 2. When the force is applied to the axle, the section at the top of the gyroscope will try to move to the left, and the section at the bottom of the gyroscope will try to move to the right, as shown. If the gyroscope is not spinning, then the wheel will fall over. If the gyroscope is spinning, the top point on the gyroscope is acted on by the force applied to the axle and begins to move towards the left. It continues trying to move leftwards because of Newton's first law

of motion but its spinning action rotates it as shown in Figure 3. This effect is the cause of precession. When considering the gyroscope in individual sections, the gyroscope receives forces at one point but then rotates to new positions. When the section at the top of the gyroscope rotates 90 degrees to the side, it continues in its desire to move to the left. This is exactly the same for the section at the bottom, as it rotates 90 degrees to the side and it continues in its desire to move to the right. These forces rotate the wheel in the precession direction . As these points continue to rotate a further 90 degrees, their original motions are cancelled, creating the resistance to the movement of the axis.

In brief, the gyroscopic forces created by the rotating wheel resist the force initially applied to the axle, keeping the wheel steady vertically while the resultant precession force causes the wheel to want to rotate in a direction perpendicular to the rotational axis, as shown by the arrows.

Vehicle stability due to the gyroscopic effect that is induced when the wheel is spinning is a key area when considering overall cornering performance. The design objective has always been to reduce this gyroscopic force as much as possible, by reducing the moment of inertia of the rotating wheel, tyre and disc package. This has mainly been done by reducing the mass of the wheel itself via the use of composites and advances in forged magnesium technology.

The use of composites was considered to be the best way to reduce the wheel mass. However, due to reliability and the inability to test the wheel properly for defects, composites are proving not to be the best solution.

This has lead to the development of composite materials such as carbon fibre to manufacture the rims and brake discs. However, the use of these materials in this way has been banned for use in many classes of competition including the World Superbike Championship. In this particular class forged magnesium rims are a good alternative with a front wheel weight of 1.4 kg but the discs have a mass greater than 2 kg each and as you must use ferrous material, therefore it is not possible to alter the disc mass much.

Another limiting factor to the problem is the tyre, as this component is very much a constant with respect to its gyroscopic properties. Some advances have been made over the years, such as by moving away from steel in the case construction to the lighter

and more flexible Kevlar. However, unless there is a big leap to another lighter material other than rubber for the bulk of the tyre, there is little possibility of changing its gyroscopic characteristics. It should also be noted when looking at the physics of the tyre as a gyroscope that its mass is all contained near the outer circumference, which is the worst place to have the mass when trying to reduce gyroscopic effects.

There have been design developments in wheel and brake disks to reduce the overall mass of the wheel and disc by mounting a single disc on the outer edge of the wheel, as seen in Figure 4. However, this does not affect the gyroscopic properties even though the total mass is lighter. This is because the single disc, while being lighter than twin discs, has a larger diameter which increases its gyroscopic output. The net result is a lighter assembly but with the same or similar gyroscopic effects.

The present invention seeks to provide a system and method for improving the performance of a vehicle, in particular a motorcycle.

According to an aspect of the present invention, there is provided a motorcycle or other vehicle including first and second wheel, at least one weight associated one of said wheels, and means operable to rotate the weight in an opposite direction to the direction of rotation of said wheel.

The reverse rotation of the weight produces an opposing gyroscopic force which, in the preferred embodiments, reduces the gyroscopic force produced by the rotating wheels.

Advantageously, the weight is in the form of a flywheel.

The system of the preferred embodiment rotates a flywheel about the wheel axis in the reverse direction to the wheel. This can be achieved in several ways; the preferred being use of the brake disc as the reverse rotating flywheel. Such apparatus can be integrated with current componentry, such as brake assemblies, forks, body work and the like.

This principle is not limited to motorcycles, as it could be applied to any wheeled vehicle with any number of wheels. Its application, although initially designed for motor sport, can be utilised within the retail motorcycling market to offer improved

performance. Moreover, it should also be noted that this principle can be incorporated into both the front and rear wheels.

Embodiments of the present invention are described below, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows the gyroscopic effect produced on a rotating body, such as a wheel;

Figure 2 shows the force applied to try to rotate the spin axis;

Figure 3 shows how the gyroscope reacts to the input force along an axis perpendicular to the input force;

Figure 4 shows a part of a motorcycle with prior art attempts to reduce gyroscopic force produced during operation of the motorbike; and

Figure 5 is a cross-sectional view of a preferred embodiment of system for reducing gyroscopic force.

Referring to Figure 5, the preferred embodiment makes use of the concept of providing a mass which is rotated in the opposite direction and on the same axis as a wheel, such that the resultant gyroscopic forces will work against each other, reducing the total gyroscopic output. This mass could be a flywheel assembly totally separate from the wheel, tyre and brake disc assembly, but in its preferred embodiment is the brake disk itself. From initial calculations, the effect is so great that in some embodiments it may be desirable to have only one brake disc contra-rotating and the other rotating in the same direction as the wheel.

By utilising the principles described above in connection with Figures 1 to 3, it is possible to validate the concept disclosed herein that when two identical objects in size and mass are rotated in opposite directions and the spin axis of this gyroscope is then rotated, as in Figure 1, the gyroscope will not precess as the gyroscopic forces created by each mass will act against each other, effectively cancelling one another out. In the preferred embodiment, the aim is not to cancel the gyroscopic forces within a rotating motorcycle wheel completely, as this will destabilise the vehicle too much. Motorbike riders utilise the gyroscopic effect to stay upright. The aim, therefore, is to reduce the

overall gyroscopic forces generated by the rotating wheels without making the vehicle unduly unstable.

The concept of reversing the rotational direction of the brake discs to the wheel on a motorcycle will reduce the gyroscopic stabilising force on the vehicle, causing it to "roll" quicker. As a motorcycle turns, it is rolled or leant inwardly to counteract the centrifugal force being created while turning. The act of leaning the vehicle over also causes the vehicle to turn in that direction as the tyres are now running on the sides. If a rider can roll/lean a motorcycle quicker, the bike can be turned quicker.

As the principle relies on the gyroscopic force of the disc to cancel out some of the gyroscopic forces created by the wheel and tyre, the system can be tuned by altering the mass of the wheel disc to increase or decrease the gyroscopic force, therefore changing the roll rate of the bike.

Referring to Figure 5, the embodiment shown is designed for a motorbike and includes a tyre and wheel assembly 10 which are formed integrally with a wheel carrier 12. The wheel carrier 12 is supported on an axle 14 through bearings 16. These components of the wheel assembly are conventional.

A brake disc 18 is also mounted on the axle 14 by means of an integral brake disc carrier 20 and bearings 22. The brake disc 18 is coupled to the tyre and wheel assembly 10 by means of a gear assembly including first and second sets of crown gears 24, 26, respectively, which co-operate with one another through a pinion gear 28. The gear assembly 24-28 is designed such that the brake disc 18 rotates in the opposite direction to the tyre and wheel assembly 10 so as to produce a counteracting gyroscopic force, dependant, in this embodiment, upon the relative weights, on the one hand, of the wheel and tyre assembly 10 and, on the other hand, of the brake disc 18 and brake disc carrier 20 assembly.

The embodiment of Figure 5 was built as a test rig which, when rotated, allowed the operator to feel the difference in gyroscopic output through his/her hands.

The embodiment described and tested utilises bevelled gears 24-28 to reverse the rotational direction of the wheel 10 to disc 18. However, in practice, it is envisaged the system would use conventional gears arranged in a similar way to a planetary gearbox.

A system using a planetary style gearbox would be preferable as it would be able to transmit greater breaking forces and have less running friction.

Referring again to Figure 5, the bevelled gear design operates as follows. When the axle 14 is retained, preventing its rotation, and the wheel 10 is rotated in any direction about the axle 14, the crown gear 26 attached to the wheel carrier 12 also rotates. This then forces the pinion gears 28 to rotate about their own axis. In turn, the other crown gear 24, which is attached to the brake disc carrier 20, then forces the brake disc 18 to rotate in the opposite direction to the wheel.

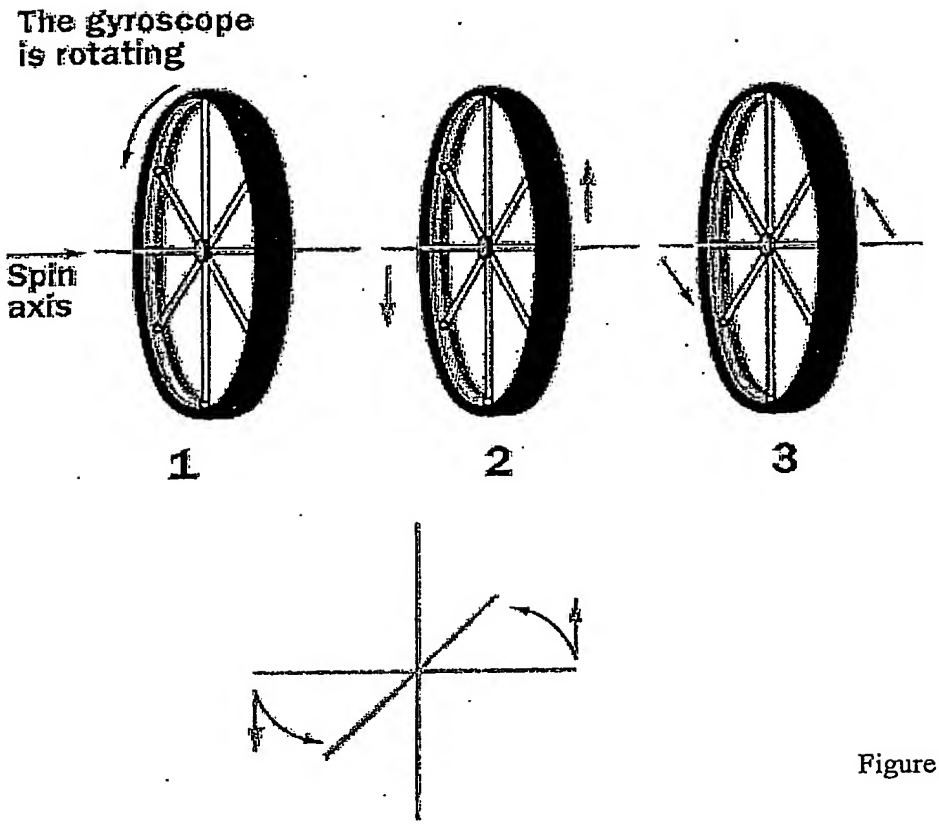

Figure 1

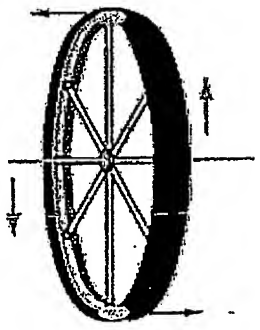

Figure 2

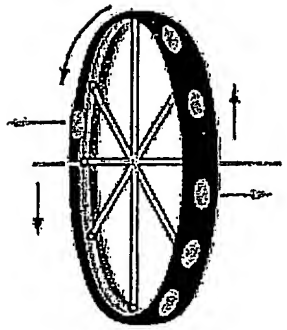

Figure 3

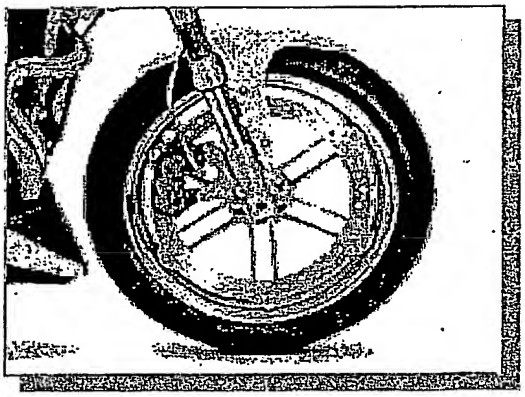

Figure 4

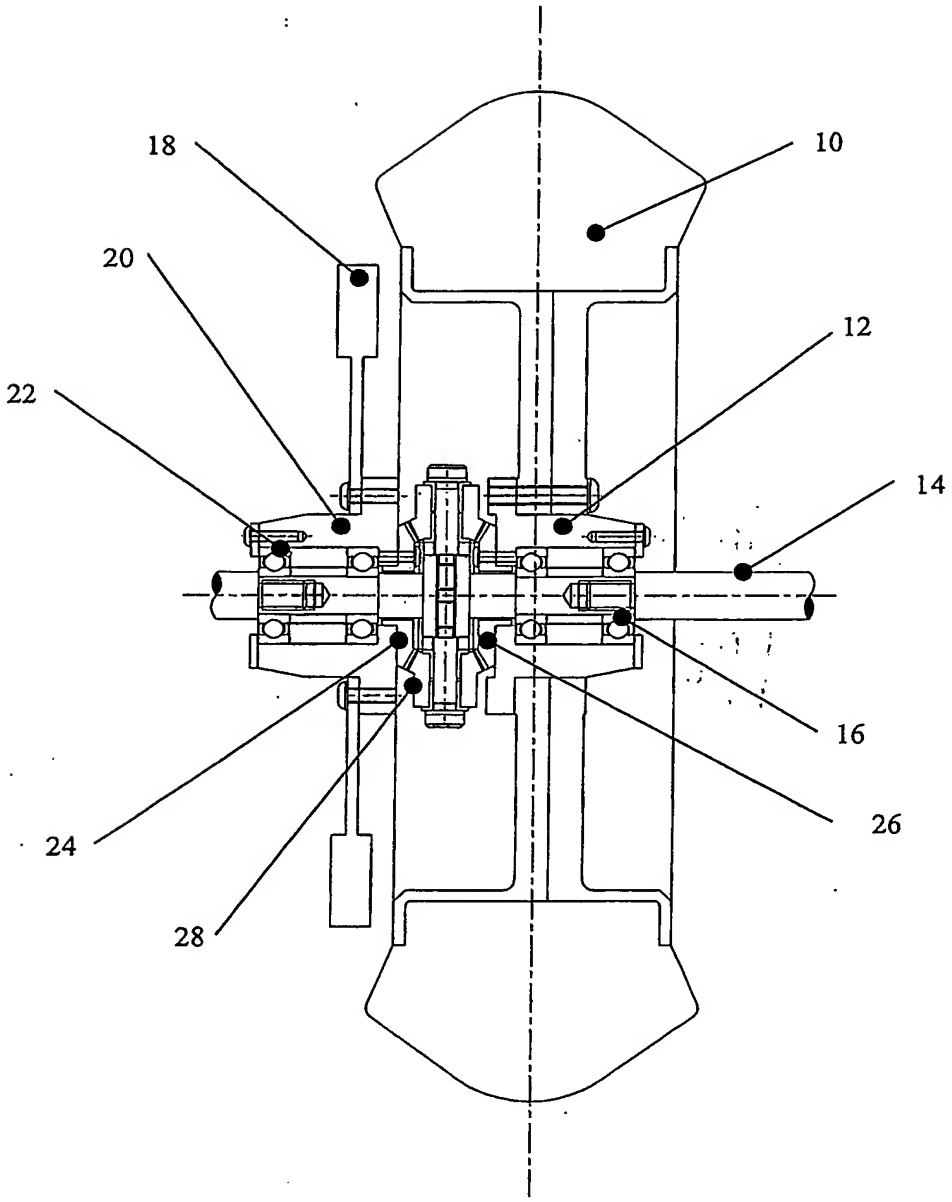

Figure 5

PCT Application
GB0304121